DOCUMENT RESUME

ED 247 900 IR 011 249

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TITLE Designing Your Computer Curriculum: A Process Approach.
PUB DATE [84]
NOTE 26p.
PUB TYPE Guides - Non-Classroom Use (055)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Computer Assisted Instruction; Computer Oriented Programs; *Computers; Educational Planning; Elementary Secondary Education; Evaluation Methods; *Needs Assessment; Policy Formation; *Program Development; *Program Evaluation; *Program Implementation; Reading Instruction; *School Districts

ABSTRACT

Four essential steps for integrating computer technology into a school districts' reading curriculum--needs assessment, planning, implementation, and evaluation--are described in terms of what educators can do at the district and building level to facilitate optimal instructional conditions for students. With regard to needs assessment, consideration is given to district goals, personnel, budget, facilities, Board of Education support, Central Office support, and school mandates. Planning concerns discussed include the purpose of computer implementation, the location of computers in the schools, student/teacher assignments with computers, time schedule for computer usage, computer hardware/software synchronization, inservice for staff, and evaluation techniques. Critical implementation factors described include appointment of a district-level coordinator, selection of school-level coordinators, and parental involvement. The discussion of evaluation delineates how to solicit the most appropriate feedback regarding the district's computer curriculum, and notes that evaluation should be keyed to goals and include evaluation of the personnel directing and implementing the program. Conclusions indicate the need for reading educators to develop functional literacy with currently accepted media. Twelve references are listed. (Author/LMM)

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DESIGNING YOUR COMPUTER CURRICULUM: A PROCESS APPROACH

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The pressures of being an educator in the 1980's are immense. Questionned, criticized, and cajoled, the American institution of education is under attack from the federal government, state government, the business community, and the media. The onslaught of recent reports, the rehashing of old solutions, the advocacy of new reforms, and the idea that schools should be better than the society that surrounds them have continued to make education the target of social reformers and politicians with national ambition. The arrival of computers and its accompanying "high tech" jargon have challenged educators to be in the forefront in preparing America's youth for tomorrow's technological demands.

Unlike most educational innovations and reforms, educators have accepted and, in many cases, welcomed the introduction of computers into their schools. While computers can be intimidating, the tremendous growth of computers in our elementary and secondary schools is a testimonial to the glowing acceptance of this technology by people who are usually conservative in nature (Lortie, 1975).

This article is an attempt to help educators, at the district and building level, plan and develop goals and strategies to make this form of technology work for students. Currently, the issue in education is not the usefulness of the computer but how it can be best used to help educate children and manage our school districts more efficiently.

Four essential steps for integrating computer technology into a school district's curriculum will be addressed. The specific areas of needs assessment, planning, implementation, and evaluation will be discussed in relation to computers, reading, and the processes which bind them.

NEEDS ASSESSMENT

Prior to the planning, implementation, and evaluation of any curricular innovation, a school district should embark on an intensive needs assessment. This process has been identified as a necessary first step to determine where the district currently stands in relation to its stated goal. The needs assessment process is basically a "discrepancy model" which gives a status report to the district. As a result of the needs assessment, the school district will be cognizant of the areas in which it must improve itself so that district goals can be accomplished. The following steps should serve as a guideline for districts that are interested in fully utilizing microcomputer technology for their students.

District Goals

The school district must carefully enumerate its goals with regard to microcomputer technology and reading. Basically, the district will be asking itself the question, "what do we want to do with our microcomputers with regard to reading?" Most school districts might create a committee consisting of administrators, teachers, parents, school board members, and possibly students. This committee should consider the formulation of short- and long-range goals. Specific timetables should be formulated with a procedure for monitoring progress. These goals should be student oriented and attainable in light of the district's characteristics.

Personnel

School programs are only as good as the personnel who operate them. The school district should survey their professional staff in order to determine if there are qualified and interested personnel who can successfully implement the program. Since the microcomputer revolution has spawned a great interest among educators, the school district may be surprised by the number of staff members who have taken courses in computers or who have become proficient in computers because of home use.

It is incumbent upon the district to identify key staff who must become knowledgeable of the impact of computers on the curriculum. There are many members of a school district's staff who are interested in the computer field but who are not yet proficient or skilled in this area. Once determined, the district must decide if there are a sufficient number to meet the district's program goals. Hopefully, this number will include some people who are skilled in the teaching of reading. If requirements are not met by district personnel, skilled individuals from outside the district should be hired.

Budget

Once goals and staff competencies are determined, the budget process must be addressed. Despite price reductions, computers are an expensive curricular innovation and will never be properly implemented without adequate budgetary allocation.

The committee should study the present district budget and determine if funds are available for this technology. It is entirely possible that, aside from using funds from other budget lines, additional district monies should be allocated for computers. School districts will have to set aside specific amounts of money which can be depended upon for the next several years. Short- and long-term budgets will have to be drawn up to ensure careful planning. The financial history of the district also must be examined so that precautions can be taken for school districts' whose budgets are consistently rejected by the voters. Furthermore, funds received from state and federal sources will have to be investigated in terms of their dependability and flexibility.

Facilities

Facilities are a sometimes overlooked but essential factor in the needs assessment process. Poor physical facilities can hamper the effectiveness of a program regardless of the amount of planning that went into the program. A school district should determine the number of rooms available for microcomputers versus the number it needs to implement the program. Also, it must explore the suitability of these rooms with regard to electrical outlets, furniture, air conditioning, and future expansion. For many school districts, this will afford them the opportunity to utilize unused space in undercrowded schools. For schools that have older facilities or are overcrowded, this might necessitate moving students to smaller and more cramped quarters. Determining the amount of space and type of facility required can be a sensitive issue in many school

districts. The committee might consider studying the school district's entire physical plant in order to ensure that student movement is minimized and that long-range goals can be met. Class size could become an important issue if students are to receive individualized instruction, particularly in the area of reading.

Board of Education Support

Board of Education support for this type of curricular innovation is absolutely essential. Presumably, the formation of a committee to conduct a needs assessment would assume some form of board support. However, the committee, despite the fact that it is an agent of the board, must determine the extent of the board of education's commitment to this project. The committee must report to the Board what the financial requirements are in order to meet the district's goals. Once the committee has determined the extent of board support, it must keep the board fully informed of all developments and, if possible, make the board a partner in the support of district goals. If the board members on the needs assessment committee are staunch champions of microcomputer technology, they may be able to support and/or convince other board members of the utility of microcomputers to assist in student learning.

Central Office Support

The amount and type of support that is required from central office personnel must be determined. The superintendent, the educational leader of the school district, must be in the forefront of implementing computer technology. The committee should explore the areas where the

superintendent can be most helpful; for example, speaking before community groups, convincing reluctant building administrators and shepherding proposals through the board of education. If the superintendent is not a willing participant, the committee should explore alternate means of invoking the support of the chief school administrator. Strategies such as keeping up with other school districts and having certain board members apply subtle pressure to the superintendent can serve as gentle mind changers.

The school business administrator or the assistant superintendent for business is a key participant in the needs assessment process. The help of this person can significantly simplify the budget process for purchasing large amounts of computer equipment.

School Mandates

The committee should explore the existence of any state mandates governing the use of microcomputers. Committee members should contact personnel from the state department of education to inquire about rules and regulations governing the purchase, use, and operation of this form of technology. The existence of state mandates can serve as a starting point for the district's needs assessment. Also, state mandates may influence the budget process, the type of facilities used, the staff certification of those involved in computer instruction, and the district's ability to utilize computers for certain types of students.

The committee should also find out if the state has reserved special funds for the use of computers. If so, districts may consider applying for grants which require the use of microcomputer technology in the schools.

PLANNING

The heart of any educational process is in its planning. If planning energies are channeled properly, an inordinate amount of time and money can be saved. A plan for computer implementation, therefore, must be well-conceived and thoroughly researched; otherwise, it will suffer the same criticism as other educational gimmicks which have been based more on myth than on reality. This plan should also be integrated into the reading curriculum and any software acquired should reflect the district's philosophy of teaching reading.

Planning should begin by forming a small committee if one has not been established during the needs assessment phase. The chairperson of the planning committee should be responsible for assigning tasks, reporting to the appropriate administrative levels, and stimulating interest beyond the planning committee. Once the committee has been established, it should study the data available from the needs assessment. This information should be considered when making decisions about the following factors: purpose of computer implementation; location of computers in the schools; student and teacher assignments with the computer; time schedule for computer usage; computer hardware and software needed; inservice schedule for staff and evaluation techniques for assessing the plan. Since the committee's response to each of these factors embodies the committee's goals, it is important to address each factor separately.

Purpose of Computer Implementation

Computers can be implemented with the following purposes in mind: awareness, application, and programming. Awareness involves knowing about the evolution of computers in the work force; how they are used today and how they could be used in the future (e.g., artificial intelligence). It also includes an understanding of our present-day information explosion and our need to manage this information at home and at work.

Application incorporates the computer's broad spectrum of uses in relation to the real world. Particularly important to a school district's domain is the use of computers for word processing, data-base management and computer-assisted instruction.

Programming involves knowing how to communicate with the computer in any one of a number of computer languages. School districts have used such popular languages as Logo, BASIC, and Pascal in their K-12 curriculum. In considering these three purposes of a computer literacy program, it is important to weigh how each contributes to the reading program. Just as word processing can be applied easily to the improvement of reading/writing skills, Logo also can be used in the development of critical/creative thinking. How each facet can be integrated into a cohesive curriculum should be examined carefully by the planning committee.

Location of Computers in the Schools

Where computers will be placed will help to determine their purpose in the curriculum. Should computers be placed in individual

classrooms or reading labs? Should they travel from school to school on alternate weeks to provide for broader student usage or remain permanently in one building to avoid mechanical problems? The planning committee should be actively involved in short- and long-range planning. While few computers may be available today, many more could be available in five years. Somehow, the combined effect of some newly discovered surplus money from a school district's budget and the skimming price policy of some competitive computer companies will provide for the acquisition of many more computers.

Student and Teacher Assignments with Computers

Different student populations may have differing needs and interests for the computer. Not only must the type of school district be taken into account but also the types of students within each school district. In the former sense, it means considering the urban-suburban differences in school districts. Generally speaking, urban children's computer involvement may emanate primarily from the schools whereas suburban children's involvement may stem from both the home and school. While urban school districts need to compensate for what is not in the home, suburban school districts may need to embellish on what is in the home. In the latter sense, children at different instructional levels may need varying degrees of computer assistance. While children in gifted programs could thrive on complicated problem-solving software programs, children in remedial programs could enjoy some of the more engaging drill and practice or tutorial software programs.

Given the characteristics of the community, the initially limited budget and resources available, the planning committee must decide which students should benefit most from computers. Should computers be offered superficially to all K-12 students or should they be offered to the gifted, remedial, or special education students? Since funded computer education programs' appropriations comprise most of the available funds, are the compensatory education students the primary beneficiaries?

Another consideration for the planning committee is the teacher. With the advent of data-base management systems, teachers can keep accurate and current records of all students in every curricular area. This could provide a more comprehensive understanding of students' strengths and weaknesses and, ultimately, be the impetus behind individualized instruction.

Time Schedule for Computer Usage

Student and teacher use of computers depends on the number of computers and their whereabouts. If a few computers are placed in one school, the computer coordinator or the building principal must schedule classes at the appropriate times. The planning committee can provide input as to the most educationally sound schedules for the computer resources available.

Computer Hardware and Software Needed

Computer Hardware - Coordinating the purchase of microcomputer hardware and software is not as mysterious as it is time consuming. It is simply a matter of realizing that computers should not be purchased in a vacuum; they should be bought to satisfy short- and long-term curriculum objectives. Also, computer purchases should not be delayed for the sake of buying more for less in a few years. Unfortunately, many fall prey to the eternal wait for the impossible instead of tapping available resources with today's technology. Even with the diminished costs and technological leaps of the future, today's purchases will still stand students and educators in good stead tomorrow.

Computer hardware, like any manufactured product, has an array of features for purchase consideration. Critical features for any computer system involve software selection, ease of use, durability, reliability, documentation, and expandability. Software selection is a primary consideration for hardware purchases. The desired software must be compatible with the hardware; otherwise, all planning efforts will have been futile. Presently, the Apple II plus and IIE computers, the TRS-80 Model III and 4 and the Commodore 64 offer the most educationally viable software packages. While the Apple is currently today's bellwether among educators, it could become tomorrow's anachronism. It is, therefore, important to recognize the quixotic nature of the computer field and to plan for changing trends in computer hardware purchases.

Ease of use for educators refers to the level of technical skill needed to operate the computer, the keyboard and the flexibility to add peripherals such as joysticks, light pens, and printers (Patterson and Patterson, 1983).

Durability refers to the hardware's capacity for withstanding the daily abuses from students and teachers. Similarly, reliability reflects the hardware's history of dependability in active educational settings. Both durability and reliability are extremely important when a computer is expected to service large numbers of children in reading lab situations. Current users, vendors, and hardware evaluators are excellent resources for investigating the quality of the computer's life span.

Documentation (teacher's guide) refers to the manufacturer's written guide for using the computer. Good documentation can save educators many agonizing moments if it is written in an easy-to-read, communicative style.

Expandability deals with the capability of enlarging the computer's memory and adding on such peripherals as printers and scanners. In this case, wise purchasing would include a system which meets current objectives and could be expanded to accommodate changing needs.

Other features such as color, upper and lower case letters, available languages and computer memory should be considered in relation to planned objectives. Color graphics are essential if the computer will be used for computer-assisted instruction in reading; however, they are unnecessary if the computer will be used for computer-managed instruction or word processing. The upper and lower case letter option on computers is particularly important if the computer is to be used for report writing or student compositions. As with color graphics, it may be more sensible to incur the extra cost for better educational opportunities.

Another important consideration is the languages available on the computer. If computers are to be used for teaching the programming languages of Logo or Pascal, it is essential to investigate whether the computer accepts these languages. To date, only the Apple IIE and Commodore 64 have programming packages for both languages. Other computers such as the Atari 600/800 XL and the Radio Shack Computer 2 accept the Logo package whereas the Radio Shack TRS-80 Model 4 and IBM PC accept Pascal (Electronic Learning, 1984). With time, other computers will accept these languages but such futuristic promises will not satisfy a school district's present needs.

The computer's Random Access Memory (RAM), or space available for loading programs and putting information into the computer (Patterson and Patterson, 1983), needs to be considered when purchasing a computer. While prudent to pay for the least amount of storage space necessary, it is foolish to buy too little memory for one's programming and application needs.

Overriding this understanding of hardware feature options is the ability to synchronize budgetary allotments with computer costs. Once one or more hardware products are selected, the planning committee should comparison shop with local computer stores, retail department stores, manufacturers, and mail-order outlets. If the school district must solicit bids for its hardware, it should mail the bid specifications directly to those suppliers who are lowest in price. Also, by coordinating efforts with local school districts, a district's planning committee may be

able to jointly engage in purchasing larger quantities of computers at reduced rates. Indeed, a tremendous amount of time and effort is required to buy the right computer at the best possible price, but the rewards accrued will be worth the investment.

Software - Responsible software selection requires an understanding of the types of software available. While many different software categories exist, all are not appropriate for reading development. A description of each category follows:

. Drill and Practice - Drill and practice software basically supplements previous instruction through the development of skills and concepts. Even though a large percent of existing educational software is of the drill and practice variety, this type of software often wastes what a computer can do. Numerous reading packages exist in this category, albeit with more blemishes than the worst workbooks.

Tutorial - Tutorial software not only teaches rules and concepts but it also shapes the interaction between student and computer through student input. It can stand alone as an instructional unit. Considered to be more sophisticated than an animated workbook, tutorial software recently has received more attention by reading educators.

Simulation - Simulation develops problem-solving skills by enabling students to interact in environments which are otherwise too expensive, complex or remote for classroom use. While not used for the development of reading skills per se, students need to read and respond critically to the situation parameters.

Gaming - Gaming, the application of skills and concepts in a recreational fashion, usually encourages more entertainment than learning. It does, though, facilitate rule learning and provide opportunities for the formulation and revision of reading/thinking strategies.

Problem-Solving - Problem-solving requires the use of skills and concepts in a new context. With this software, strategies are developed to solve problems and to learn how to program. Reading skills are not taught directly; yet, students learn to think sequentially, critically, and creatively.

Instructional Management - This type of software helps teachers and administrators keep student records, schedule classes, test students and communicate with others. Built into some of the aforementioned software packages, instructional management software can be an excellent way to identify students' reading strengths and weaknesses.

Tool - This software provides an alternative method for efficiently accomplishing a given task. Particularly interesting for reading educators is how one tool, word processing, can be used for language experience and reading/writing development.

These categories serve as a starting point for the evaluation and ultimate selection of computer software. Beyond this, it is important to consider the degree to which the software is an improvement over workbooks. For instance, computers can randomly select items to be presented in reading; workbooks cannot. Does the software program in question do this? Also to be considered are the computer's capabilities for branching. Specifically, if a student gets an item incorrect, will the computer provide the student with easier items before proceeding to more difficult ones?

Graphics is another capability which entices children to use reading software for extended periods of time. This type of reinforcement should be programmed to reward correct answers. Sometimes, inappropriate reinforcement follows incorrect answers; thereby, provoking students to answer items incorrectly. Students would prefer to get an item incorrect if they know that they will get to watch the creation of a dragon. Obviously, if the reinforcement is inappropriate, the software should be replaced with a more effective instructional tool. While considering reinforcement, it also is important to analyze whether the software provides immediate or delayed gratification.

Software also can be designed to be repetitious. For students who need extended exposure to isolated skills or broad concepts with appropriately challenging and varied exercises, this capability is extremely important. Reading teachers especially should evaluate software for this capability.

Being congnizant of the types and capabilities of software helps the planning committee purchase wisely. While considering what to buy, the planning committee should be accumulating pertinent software information. By attending conferences, joining consortia, getting on mailing lists, speaking to sales representatives, talking to other school districts, purchasing software reviews (e.g., EPIE, Microsift), and previewing software at one's home base or neighboring preview room, the committee will have enough background knowledge to purchase the best software available. Again, the committee should reiterate the need to coordinate the software with the hardware.

Inservice for Staff

Staff inservice is the catalyst for any instructional change. Without it, grandiose plans may never be implemented. Part of the planning committee's responsibility is to design ways in which to help teachers learn the values and attitudes desired for computer implementation. Consideration should be given to district inservice courses for credit, professional visitation days to conferences or other actively involved school districts, and workshops with local and outside talent.

For inservice plans to be effective, they should be thought of as a continuous process for teachers, administrators, and community members. Since initial exposure to computers usually is intimidating, at best, inservice sessions do become the great equalizer for the school district's professional hierarchy. People at all levels learn to become interdependent as they try to discover the universality of computers.

Evaluation Techniques

The planning committee's final task is to decide upon evaluation techniques. Although evaluation is often feared, it really is the backbone of curriculum improvement. If people regard evaluation as a process for improving rather than for proving, they will regard it favorably and enthusiastically. Decisions should be made regarding what will be evaluated, how it should be evaluated and by whom. If evaluation is ongoing and clearly defined, major problems can be alleviated. Any time taken to anticipate implementation nuances will help the district avoid catastrophes.

IMPLEMENTATION

The implementation of the computer program requires the appointment of a district level person to be in charge of the entire program. This person should have the authority and responsibility for the program's operation and should report to the superintendent of schools or his/her designee.

Depending upon the results of the district's needs assessment of personnel, this person could come from within the school system. However, if a person is unavailable, the district should conduct a search to find the most qualified person. Obviously, the person should have a strong background in computers and reading, particularly in the areas of selecting hardware and software. Experience in operating a computer facility would be preferable. However, while computer knowledge can be

learned; human qualities are a little harder to acquire and may be more vital to the success of the overall program. Human qualities such as collegiality, ability to work with upper management and teachers, patience with maintenance personnel, adaptability to the district bureaucracy, and insight into how schools work and children learn are critical for success.

Following the appointment of this person, one of his/her first tasks is to select school-level coordinators who will be responsible for the day-to-day operation of the computer curriculum within their buildings. The qualities of these prople, professional and human, should be similar to that of the person responsible for the program on a district-wide level. Unless the needs assessment in personnel reveals a dearth of qualified or interested personnel, it would be wise to select these school-level coordinators from within the staff of the school system. Selection from within the school system would hasten teacher enthusiasm for the program and these people already would be familiar with methods and operations of the school and the district.

It is necessary for the school level coordinators to have frequent and formal communication among themselves and with the district level person. A procedure for the monitoring of the program would have to be developed, and specific tasks and job descriptions would have to be clarified.

During the early phases of the program's implementation, it is important that all concerned have realistic expectations for the program.

Regardless of how carefully the program has been planned, a program of this nature and magnitude (depending upon the size of the district) will almost always have to be modified. The program staff should be flexible in response to problems and should be prepared to face resistance from some of the teachers and administrators within the district and their particular school. The district coordinator and the school-level coordinators should be aware that most schools function as their own school district, and that attention must be paid to the time-honored traditions and protocol. Failure to recognize these situations could result in serious harm to the program and to the education of the students.

Once the program has become operational, parental influence becomes important. A well-defined public relations campaign should be used to inform parents of the program's purposes and what their own children will gain from the use of computers. If possible, this campaign should involve not only the superintendent, but should involve parents with their child's classroom teacher. Parents will want to know when their children will be using the computers and how they will be using them.

An important component of the computer curriculum should be parent inservice courses and/or workshops. Since many parents have computers in their home or are interested in purchasing a computer for their home, they may be influenced by the hardware that the school system has purchased. Specifically, parents will want to know what

software to purchase, where they can go to pay the lowest price for hardware and software, and how they can help their child at home with the computer. A successful inservice course for parents can be a major contribution to the program's success and can have important ramifications for the district's future plans.

EVALUATION

The evaluation of the program should be keyed to the goals established for the program. This part of the evaluation process will reveal whether goals have been met or whether unrealistic goals and timeframes were established. Since the program was created with input from all members of the educational community, feedback should be solicited from all parties connected with the program, including the students. This data can be gathered through the use of interviews, on-site evaluations, survey questionnaires, and face-to-face communication. Also, the person responsible for this process may want to look at hard data like reading scores, pupil attendance, report cards, and teacher attitudes.

Gauging the effect of computer-assisted instruction on student reading achievement may be a difficult task. Ascertaining a direct correlation between student achievement in reading and the use of computers might necessitate a longitudinal study with interim reports. In

a school district with high student mobility, this type of study would not be appropriate and another method would have to be found. However, the district might be able to readily attain information on how the use of computer technology affected student attitudes toward reading.

Evaluating the personnel who direct and implement the program is crucial. It is entirely possible that once excited and challenged people would find that the realities of the program did not match their expectations. Personnel changes or modifications in the behavior of program personnel might have to be contemplated. Wholesale changes in program personnel should be avoided because of its long-term effects on program continuity and morale.

The evaluation procedure should consider all phases of the process including needs assessment, planning, and implementation. The evaluation team should determine whether or not goals need to be modified in either one or all of the above program phases.

Once the entire process of evaluation has been completed, the school district, including the parents, must be informed of the evaluation results. The superintendent should explain that, even if the evaluation reveals problems, the district's commitment to educational technology will not be abandoned. This may help soften the blow of any negative comments and bring all parties to the realization that while the program may be changed, computers are here to stay as an important component in our everyday lives and in the everyday education of our children.

CONCLUSIONS

For whatever reasons, education usually has lagged behind other fields in accepting technological revolutions (Willis and Miller, 1984). Having had false starts with computer-assisted instruction in the 1960's, educators have been justifiably remiss in jumping on this refined bandwagon of technology. However, enough improvements and mistakes have been made to produce cost-effective versatile computers for the most recalcitrant educators. Computers are no longer regarded as a fleeting fad of inconsequential effect; they are viewed as a megatrend with indelible worth (Naisbitt, 1982).

As reading educators, we can appreciate the need to develop functional literacy with currently accepted media. We can overcome our fears of fragmented learning situations with satisfaction that we are preparing our students for the holistic demands of society. Realizing ways of applying computers to the reading process will not be as difficult as designing a viable curriculum plan. The need for reflection and flexibility should help to counteract any failures in the plan. The hope for improved learning and an enlightened citizenry should be the driving force behind this challenge.

The future of computers in education is our responsibility. Avoiding them will perpetuate blissful ignorance; acknowledging them from a distance will provoke mindless intimidation; utilizing them to their fullest potential will enhance personal growth.

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